Institutional quality, economic development and the performance of VAT*

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Abstract

We investigate the contribution of the Value-added tax (VAT) to tax revenue in a sample of 149 countries and examine how this performance is affected by institutional quality and economic development. Our panel data analysis shows that better institutional quality translates to higher revenue collection – even without VAT adoption. VAT adoption also improves tax revenue collection, even in a weak institutional environment such as in Sub-Saharan Africa, where earlier studies were unable to find clear positive effects.

JEL classifications: H20, H21, H25, H26, O11, O17
Keywords: value-added tax (VAT), tax revenue, tax reform, institutions economic development

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1. Introduction

The global push for developing countries to enhance their tax revenue mobilization efforts is paramount to bridging their significant financing deficits, a sentiment echoed by a range of studies and international directives since the early 2000s (Benitez et al., 2023; Akitoby et al., 2020; Ahlerup et al., 2015; UNECA, 2016). Beginning with the 2002 International Conference on Financing for Development in Monterrey, Mexico, the international community has consistently emphasized the necessity for developing nations to bolster domestic resource mobilization to achieve and maintain their growth targets. Successive conferences in Doha (2008) and Addis Ababa (2015) have further solidified consensus on this imperative among developing nations and their global development allies. This paper rigorously examines the influence of value-added tax (VAT) and institutional integrity on tax revenue, contrasting findings between developed and developing countries.

VAT has emerged as a comparatively easy-to-administer tax system, noted for its self-enforcing nature and effectiveness in curtailing non-compliance through an invoice trail (Bird and Gendron, 2007; Le, 2003; Lin, 2008). In developing countries, VAT can thus be used as a tool to reduce the size of the informal sector (Boadway and Sato, 2009). Furthermore, VAT is one of the least distortionary taxes (Kneller et al., 1999; Le, 2003). In contrast to other consumption taxes, VAT does not entail cascading effects (i.e., taxes on a commodity are levied at each stage of the production chain without deductions), since sellers (i.e., businesses paying VAT) can claim credit for the VAT paid on their intermediate inputs. The empirical literature shows that VAT adoption tends to positively impact government revenue in OECD countries (Keen, 2008; Keen and Lockwood, 2006). For instance, Keen and Lockwood (2006) found evidence to support this positive effect for 30 OECD countries, using data for the period 1965–2004. They term this revenue-enhancing impact of VAT adoption as the 'money machine' hypothesis.

While it is generally expected that the introduction of a VAT would lead to an increase in tax revenue, there are some scenarios in which it may result in a decrease in government revenue at least in the short run. For instance, introducing a new tax system requires significant administrative and technological resources. The costs of setting up the necessary infrastructure, training personnel, and enforcing compliance can be substantial. In the same vein, following VAT adoption, firms may increase prices, causing consumers to reduce their purchases, leading to a decrease in sales and tax revenue. Moreover, the introduction of VAT in African countries has coincided with the abolition of trade taxes. In this case, if the revenue generated by VAT adoption does not compensate for the reduction in trade tax revenue, the total tax revenue will not increase.

In line with this intuition, Keen and Lockwood (2010) analyzed data on a broader sample of 142 countries over the 1975–2000 period. Their findings confirmed the positive effect of VAT on tax collection in several developed and developing countries, but not in sub-Saharan Africa (SSA). They predicted an average negative impact of VAT in SSA countries.[2] In a related study, Ahlerup, et al. (2015) found that VAT adoption has not increased government revenues in SSA (based on their study over the 1980–2010 period). Also, Alavuotunki et al. (2019) investigate the effects of VAT introduction on inequality and government revenues, analysing an updated sample period (1975-2010) of the country sample analysed in Keen and Lockwood (2010) and employing similar methodologies . Their findings suggest that VAT introduction may have both short-term and long-term negative impacts on government revenue.

2 They report 14 SSA countries with negative effects, versus 11 countries with positive effects in the region.

This paper rigorously examines the influence of VAT and institutional integrity on tax revenue, contrasting findings between developed and developing countries, and expanding on the literature (Ahlerup et al., 2015, Alavuotunki et al., 2019, Keen and Lockwood, 2010) by including data from 149 countries over a longer period (1970–2013). This comprehensive dataset allows us to reassess the impact of VAT, especially in sub-Saharan Africa (SSA) through a sub-period analysis (1970-2000 vs. 2001-2013). Previous studies had inconclusive results for VAT adoption for the region.

Our study differentiates itself by explicitly considering the role of institutional quality in the effectiveness of VAT adoption. While previous research, such as Ahlerup et al. (2015), has analyzed the general impact of VAT on tax revenues in SSA, our study delves deeper into how the quality of institutions (e.g., government effectiveness, regulatory quality, rule of law) interacts with VAT implementation to influence tax revenue outcomes. Additionally, we address potential endogeneity in VAT adoption using a two-step system generalized method of moments (SYS-GMM) estimator. We provide robustness analysis for endogeneity (see Section 3.4) by estimating a VAT adoption equation in the first stage, where the VAT dummy is regressed on the explanatory variables used in the tax revenue function. In the second stage, we incorporate the residuals from this VAT adoption equation into the tax revenue function. This approach is critical because the decision to adopt VAT may be influenced by pre-existing tax revenue levels or other confounding factors, such as favorable economic, policy, or institutional conditions.

A good institutional environment should improve both the demand and the supply factors inherent to the performance of VAT. Existing research has documented the role of institutional factors (such as the capacity of the tax administration to deter non-compliance, government effectiveness in providing public goods, trust in the government, social interactions, culture and regulatory issues, etc.) in influencing the effectiveness of tax policies and tax compliance (Araujo and Arvate, 2016; Bird et al., 2008; Bodea and Lebas, 2014, Cnossen, 2015; Moore, 2014). For instance, a cross-country analysis presented by Bird et al. (2008) points to a positive role of institutional factors (such as control of corruption and accountability). Ahlerup et al. (2015) show the vital role played by institutional reforms in SSA, such as the establishment of autonomous revenue authorities, alongside tax policy reforms in the region, in boosting tax revenue.

We add value to this literature by investigating the effect of institutions (government effectiveness, rule of law, voice and accountability, control of corruption, regulatory quality, and political stability) on tax collection in the presence of VAT adoption for a large sample of developed and developing countries. Our contribution also includes the consideration of geographical characteristics in a panel data model for the analysis of VAT adoption.–. In particular, our study incorporates a spatial lag term that is used to control for the influence of neighboring countries' tax policies and economic conditions, recognizing that the adoption of tax policies such as VAT as well as tax revenue performance in a country can be affected by regional dynamics and policy diffusion. By accounting for these spatial effects, our study provides a more comprehensive understanding of the factors influencing tax revenue and harmonization in tax policy. This approach is particularly novel in the context of VAT research and offers new insights into how geographical and neighborhood effects shape tax revenue outcomes across different countries.

Our panel data analysis yields two main results. First, we show that VAT adoption improves tax revenue collection in SSA as well as in the two other country groups (developed and developing). The positive effect of VAT on tax collection in SSA is reassuring because earlier studies were not able to establish an overall positive effect in the region. We show that data over the post-2000 period (which saw the adoption of VAT by more than 20 SSA countries as tax

reform to shift from trade taxes to goods and service taxes) is essential to find a positive and significant effect of VAT on tax revenue mobilization in SSA.

Second, we show that tax revenue collection is higher in countries with better institutional quality – even before VAT adoption. We find that VAT adoption leads to an increase in tax revenue in both countries with strong and weak institutions. The marginal effect of adopting VAT is estimated to be higher in countries with weak institutions, possibly because the latter starts from a relatively lower tax revenue. This result could also capture the fact that VAT adoption could be combined with other institutional reforms that improve tax collection in weak institution countries. Given that VAT has now been adopted in almost all countries across the world, our finding underpins the need to support reforms to improve the quality of institutions that facilitate tax collection in developing countries. That is, countries that have adopted VAT (but witness less than optimal revenue streams) could potentially improve the revenue contribution of their VAT system by improving their broad institutional infrastructure.

The remainder of the paper is structured as follows. Section 2 presents the methodology. We present the empirical model, and, subsequently, the data used and descriptive statistics. Section 3 discusses the empirical results, and the last section concludes.

2. Methodology

2.1 Modelling tax revenue

It is commonplace in the literature to study the impacts of tax instruments on revenue collection by using the tax effort equation. The tax effort equation allows us to estimate the actual level of tax revenue collected, relative to what countries are typically expected to collect given the structure and size of their economy (e.g., Cnossen, 2015; Dioda, 2012; Gupta, 2007; Keen and Lockwood, 2010; Moore, 2014).

We employ the following empirical model for the tax effort:

$$Tax_{i,t} = \alpha + \beta VAT_{i,t} + \gamma X_{i,t} + \delta \sum_{j=1}^{n} w_{ij} Tax_{j,t} + \varepsilon_{i,t}, i = 1, \ldots, n \quad (1)$$

where:

- Tax_{it} represents the level of tax revenue to gross domestic product (GDP) ratio for country i in year t.
- $VAT_{i,t}$ is our regressor of interest, representing the policy dummy (=1 if VAT is in place).
- X_{it} represents all other explanatory variables included in the typical tax effort equation, including level of development (per capita GDP), size of the informal sector (agriculture's share of GDP), country size (population), size of dependent population (shares of the 'young' and 'old' population segments, aged under 15 years and 65+ years respectively), openness (sum of exports and imports normalized by GDP), and institutional quality (aggregate and six specific indices measuring various dimensions of governance quality). For the full list of variables used in the analysis, see Table 1.
- ε_{it} represents the random error term.
- $\sum_{j=1}^{n} w_{ij} Tax_{j,t}$ represents the tax effort in neighboring countries, measured as a weighted average of the tax collection of these countries where w_{ij} denotes the physical distance between country i and others. These weights represent entries in the spatial weighting matrix (Anselin, 1988; Cliff and Ord, 1981; LeSage and Pace, 2009). Thus, the δ parameter in Equation 1 is known as the spatial autocorrelation on tax revenue. It tells us whether the level of taxation in country i could be significantly explained by the level of

taxation in countries located nearby. The importance of including spatial determinants in our analysis is based on theoretical and empirical evidence that countries adopt VAT after observing its successful implementation in other countries (Bird and Gendron, 2007; Pomeranz, 2015), especially in neighboring countries (Keen and Lockwood, 2010). For instance, the spatial effect will be able to capture regional tax harmonization policies that could be driven by either competition or requirements for policy harmonization and integration within regional groups.

To take into account endogeneity of the right-hand side variables in equation 1 (see section 2.1 above), country fixed-effects and the dynamic structure of the model, we estimate our model through a two-step system generalized method of moments (SYS-GMM) technique. We use the two-step System GMM, as it has been shown to be more efficient than the one-step estimator (Roodman, 2009). The System GMM approach involves a system of two simultaneous equations - one in levels and the other in differences. This technique uses lagged first differences and lagged levels as internal instruments, effectively exploiting additional moment conditions to enhance the robustness of our estimations (Blundell and Bond, 1998). In section 3.4, we further examine the robustness of our results by estimating a VAT adoption equation to address the endogeneity of the right-hand side variables.

2.2 Data

2.2.1 Basic data

We use unbalanced data from 149 developing and developed countries.[3] The list of variables used, their descriptions, data sources, and basic statistics are also given in Table 1 below. Our main dependent variable (tax revenue to GDP ratio) comes from the International Monetary Fund's (IMF) World Revenue Longitudinal Dataset (WoRLD). This covers the 1990–2013 period. For robustness, we use a more comprehensive tax database compiled from different sources that span the 1970–2014 period (see the results in Table A1 in the Appendix).[4]

Data on standard explanatory variables of the tax equation come from the World Bank's World Development Indicators (WDI). Countries' VAT adoption years that are used to mark the pre- and post-VAT periods are taken from Ernst and Young (2015) and RMCD (2016).[5]

2.2.2 Institutional quality

We employ the Political Risk Services (PRS) database to measure institutional quality. Specifically, we use the aggregate and individual governance indicators of the PRS (for six governance dimensions) made available by the World Bank's Worldwide Governance Indicators (WGI). The data covers the 1996–2014 period.

Table 1: Summary statistics

Variable and description	*Mean*	*St. dv.*	*Min.*	*Max.*	*Source*

3 The country list is available in an online appendix of this paper.

4 This tax revenue database mainly combines WoRLD with the International Centre for Tax and Development's (ICTD) Government Revenue Dataset. The latter is an amalgam of diverse sources including *African Economic Outlook*, the United Nations Economic Commission for Latin America and the Caribbean database, IMF government finance statistics, IMF country reports, the Michigan Ross School of Business World Tax Database, OECD tax statistics, and Keen and Mansour's (2010) tax data for African countries (see Prichard et al., 2014).

5 See also Table 3 for VAT adoption in set of SSA countries.

Tax:‡ the ratio of total tax revenue to GDP	17.506	8.339	0.192	58.115	IMF WoRLD†
Ln(Tax):‡ the natural logarithm of total tax revenue to GDP	2.704	0.668	-1.652	4.062	Own comput.
Taxm:‡‡ the ratio of total tax revenue to GDP	16.742	8.112	0.192	58.115	Various*
Spatially lagged tax variable: the spatial lag of the total tax revenue to GDP ratio	18.033	8.056	0.946	48.386	Own comput.
Per capita GDP: the per capita income of countries (at current $)	10588	12213	207	74021	WB WDI
Ln(Per capita GDP): the natural logarithm of per capita income of countries (at current $)	8.557	1.286	5.331	11.212	WB WDI
Openness: ratio of exports plus imports to GDP	-0.336	0.553	-2.238	1.491	WB WDI
Agriculture (share of GDP): the share of the agricultural sector in the country's GDP	16.839	14.887	0.000	80.075	WB WDI
Population: size of total population of a country (millions)	32.10	119.00	0.009	1350.00	WB WDI
Ln(Population): natural logarithm of size of total population of a country	15.450	2.077	9.179	21.024	WB WDI
Old population: share of the total population aged 65 and older	6.742	4.623	0.335	24.398	WB WDI
Young population: share of the total population aged below 15	33.196	10.651	12.785	52.099	WB WDI
IMF repurchases: IMF repo transactions with members (AMT, current $ billions)	0.899	0.66	0	23.80	WB WDI
Ln(IMF repurchases): natural log of IMF repurchases (repo) transactions with members (AMT, current $)	16.651	2.059	9.306	23.893	WB WDI
Aggregate Institutional Quality Score (PRS):‡‡‡ average of the six governance indices given below	0.617	0.169	0.107	0.996	WB WGI proj.
Voice and Accountability: This indicator describes the extent to which citizens of a country take part in and are capable of genuinely electing their government. It also captures freedoms of media, association and expression (Kaufmann et al., 2010).	0.660	0.247	0.000	1.000	WB WGI proj.
Political Stability and Absence of Violence: This indicator sums the chances that the government's authority will be disabled or that governments could be unseated via violent or unconstitutional means.	0.731	0.113	0.227	0.977	WB WGI proj.
Government Effectiveness: This indicator measures the quality of civil service, the quality of public services, and the degree to which such services are free from political pressure (i.e. independent service delivery of public institutions). It also measures the quality of policy design and implementation.	0.552	0.276	0.000	1.000	WB WGI proj.
Regulatory Quality: This indicator captures the capacity of governments to design (and implement) policies and important regulations that foster private sector development.	0.675	0.213	0.000	1.000	WB WGI proj.

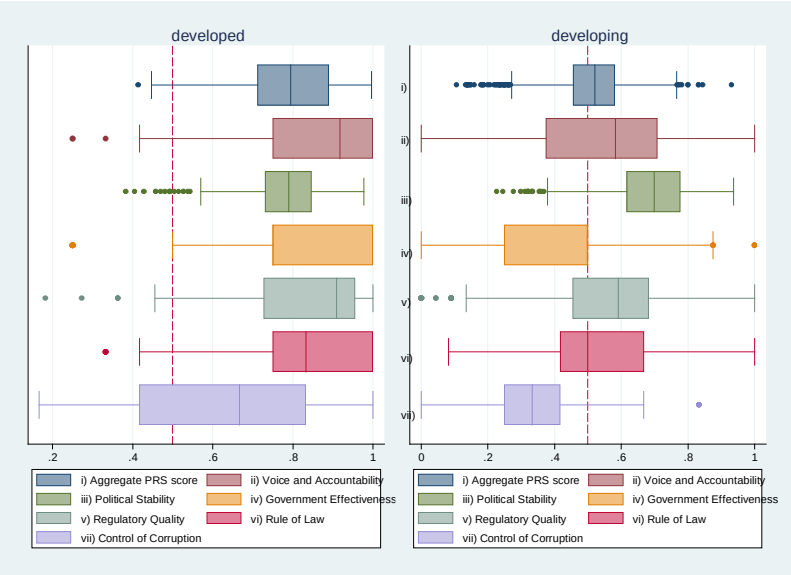
Rule of Law: This indicator measures the trust economic agents have in national laws and the extent to which they abide by them. It captures the quality (and independence) of the courts, police force, and enforcement of property rights and contracts. It also summarizes the degree of violence and crime in countries.	0.631	0.223	0.083	1.000	WB WGI proj.
Control of Corruption: This indicator measures the extent to which public resources and power are utilized for personal benefit by government agents. It captures not only large-scale abuses but also petty crime. It also reveals the extent to which the power and resources of the state are held by the elite and the private sector.	0.449	0.203	0.000	1.000	WB WGI proj.

[†]IMF WoRLD refers to the IMF's World Revenue Longitudinal Dataset. ‡Source: IMF WoRLD, data spans 1990–2014; ‡‡ Sources: various, data spans 1970–2014. WB WDI stands for World Bank, World Development Indicators

* Sources for variable *Taxm*: IMF WoRLD; IMF Government Finance Statistics; OECD tax statistics; ICTD Government Revenue Database. ‡‡‡ PRS *International Country Risk Guide* data (as well as other databases used by the WGI project) are available at http://info.worldbank.org/governance/wgi/#doc-sources

The aggregate institutional index is estimated as the average of the six individual indices: 'voice and accountability,' 'political stability,' 'government effectiveness,' 'regulatory quality,' 'rule of law,' and 'control of corruption.' All indices are scaled on the range of 0–1, and the higher the score, the better the quality of institutions in a country. Generally, we classify countries that score below 0.5 as having 'weaker' institutions, and those that score above 0.5 as having 'stronger' institutions. In Figure 1, we can see that the mean score for developed countries is clearly above the threshold of 0.5 for all institutional indices, whereas for developed countries, the average value is around 0.5. For developing countries, however, the scores on 'control of corruption' and 'government effectiveness' are below the threshold. Most developing countries suffer heavily from corruption and lack effective government administration (e.g., Aidt et al., 2008; Drury et al., 2006; Mauro, 1995). This reduces the effectiveness of their tax systems.

Figure 1: Indices of institutional quality: developed vs developing countries

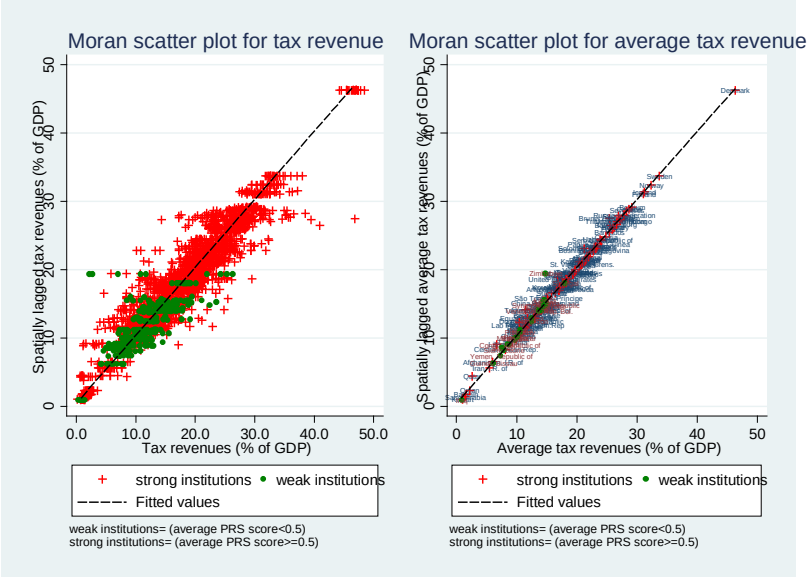


Note: Author Calculation

2.3 Spatial feature in tax revenue

Figure 2 shows that there is a very strong positive spatial correlation among countries on the basis of their tax revenues. That is, countries in the same geographic neighborhoods tend to share comparable levels of tax revenue.[6]

Figure 2: Moran scatter plots for tax revenue



Note: Author Calculation

3. Empirical results

We first present results on the regression models. After that, we discuss the results of the marginal effect of VAT adoption. Column 1 of Table 2 reports the coefficients and significance of the standard explanatory variables of the tax revenue function along with our variables of interest, i.e., the VAT adoption dummy in interaction with institutional quality. Column 2 delivers the same analysis, except that it compares developed countries with developing countries. The exercises in Columns 4, 5, 6 and 7 are intended to address the inconsistent results from earlier studies regarding VAT's performance in SSA countries. Column 3 compares SSA and non-SSA developing countries using all available time periods. Columns 4 and 5 analyse the period 1980-2010 (i.e., period covered by the Ahlerup et al. (2015) study on SSA countries), with Colum 4 analysing full sample of developing countries (SSA vs. non-SSA) and Column 5 only SSA countries like Ahlerup et al. (2015). Column 6 analyses only the period up to 2000 (i.e., corresponding to the Keen and Lockwood (2010) analysis), and column 7 analyses the post-2000 period.

3.1 Standard determinants of tax effort

Standard determinants of tax revenue and openness of the economy have highly significant positive coefficients in most cases. This result is in line with the literature (e.g., Aizenman and Jinjarak, 2005 and 2006; Rodrik, 1998; Keen and Lockwood, 2010). For instance, Aizenman and

[6] For the literature on spatial analysis and the Moran's I index, see Bai et al. (2012), Blanco (2012), Drukker et al. (2013), Getis (2007), and Kondo (2015).

Jinjarak (2005) argue that trade openness has a positive effect on VAT collection efficiency. Additionally, it is claimed that openness produces more VAT revenue because a considerable chunk of VAT revenue comes from imports, especially in developing countries (Li and Whalley, 2012; Godin, Houssa, and Megersa, 2017).[7] Also, country wealth (measured by per capita GDP) is positive and significant in both cases. This evidently shows that developed countries and countries with good institutions have higher tax revenues, on average. The spatially lagged tax variable is positive and highly significant. This implies that the level of tax revenue in other countries (close neighbours) helps to explain the level of tax revenue we can expect in a given country.

The share of the agricultural sector is consistently negative and highly statistically significant in several regressions. The literature shows that the bigger the agricultural sector is, the smaller the average tax revenue of a country will be since the sector entails a bigger informal sector (Auriol and Warlters, 2012; Keen and Lockwood, 2010; Ordonez, 2014). This is also explained by the difficulty of taxing activities in the agricultural sector (Martinez-Vasquez and Bird, 2011). The size of the population is used to proxy for the size of a country, and a positive link between the two is stated (Keen and Lockwood, 2010). They note that relatively young or old demographic is also a useful determinant of tax revenue, since it is likely to influence the level of tax needed to look after economically dependent people. The literature argues that countries with more dependent populations must raise more tax revenue to pay for these groups. Persson and Tabellini (2003), Rodrik (1998), and Keen and Lockwood (2010) observe a positive relationship between the size of the dependent/old population and tax ratio.

However, we could also see a negative relationship with the level of the younger dependent population and a positive relationship with the older dependent population. This is because rich countries (with relatively higher tax revenues) tend to have significantly aged population groups, while poorer countries (with low tax revenues) have a sizeable young population.

Results in Table 2 show that population size has a positive coefficient that is statistically significant in both regressions (i.e., columns 1 and 2). However, for coefficients of the 'young' and 'old,' we have results that are not always consistent. The empirical literature also presents inconclusive results regarding these coefficients (e.g., Keen and Lockwood, 2010). In Table 2, these two variables mostly display significant negative coefficients. However, these results were inconsistent when we ran different specifications for robustness (section 3.4).

Table 2: Conditional marginal effects of VAT adoption, institutions, and development

	Strong vs. weak institutions	Developed vs. developing	SSA vs. non-SSA developing (all years)	SSA vs. non-SSA developing (1980-2010)	SSA Strong vs. weak institutions (1980-2010)	SSA vs. non-SSA developing (pre-2000)	SSA vs. non-SSA developing (post-2000)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln(per capita GDP)	0.265***	0.241***	-0.015	-0.005	-0.151	0.086	-0.066
	(0.03)	(0.02)	(0.055)	(0.04)	(0.25)	(0.141)	(0.109)
Openness	0.159***	0.218***	0.290***	0.342***	-0.334*	0.614***	-0.454***
	(0.03)	(0.02)	(0.072)	(0.03)	(0.16)	(0.125)	(0.119)

[7] There might be some endogeneity issues associated with openness and the VAT dummy, since more open economies are also more likely to adopt VAT. We try to address these endogeneity issues by using a two-step SYS-GMM regression procedure where we also use the first differences and lags of our endogenous variables as instruments. This procedure is routinely adopted in the literature to tackle endogeneity (e.g. Blanco, 2012; Blundell and Bond, 1998; Kathavate and Mallik, 2012).

Agriculture (share of GDP)	0.046	0.01	-0.322***	-0.379***	-0.282	-0.472***	-0.277**
	(0.04)	(0.02)	(0.055)	(0.05)	(0.42)	(0.119)	(0.113)
Ln(Population)	-0.022**	-0.013	-0.035*	-0.046***	-0.043	-0.106*	0.071***
	(0.01)	(0.01)	(0.020)	(0.01)	(0.17)	(0.061)	(0.024)
Old population (>=65) share of total	-1.259***	-1.107***	-1.670***	-1.461***	0.426	-1.405***	-0.081
	(0.10)	(0.12)	(0.190)	(0.12)	(1.08)	(0.497)	(0.269)
Young population (<=14) share of total	-2.133***	-1.832***	-2.973***	-2.729***	-1.285	-1.418**	-0.702*
	(0.16)	(0.17)	(0.337)	(0.15)	(2.13)	(0.665)	(0.363)
Spatially lagged tax variable	0.990***	0.981***	0.960***	0.951***	0.976***	0.948***	0.983***
	(0.00)	(0.00)	(0.004)	(0.00)	(0.04)	(0.013)	(0.009)
Pre-VAT*Strong institutions	0.252**				-0.337		
	(0.11)				(0.93)		
Post-VAT*Weak institutions	1.499***				0.998		
	(0.10)				(0.72)		
Post-VAT*Strong institutions	0.898***				0.552		
	(0.09)				(0.66)		
Pre-VAT*Developed		-0.374					
		(0.27)					
Post-VAT*Developing		0.412***					
		(0.05)					
Post-VAT*Developed[8]		0.477***					
		(0.06)					
Pre-VAT*SSA			-0.220**	-0.237**		0.544**	-0.802***
			(0.102)	(0.08)		(0.258)	(0.304)
Post-VAT*Non-SSA developing			0.472***	0.392***		0.069	0.675***
			(0.086)	(0.07)		(0.224)	(0.137)
Post-VAT*SSA			0.494***	0.552***		-0.356*	0.484***
			(0.092)	(0.07)		(0.208)	(0.141)
_cons	6.436***	5.934***	14.522***	13.706***	6.052	9.110**	2.348
	(0.87)	(0.84)	(1.732)	(0.70)	(9.53)	(4.330)	(2.287)
N	2006	2126	1508	1421	471.000	571.000	937.000
AR(1)	0.706	0.502	0.386	0.325	0.917	0.773	0.549
AR(2)	0.086	0.042	0.055	0.228	0.418	0.358	0.190
Hansen OIR	0.879	0.684	0.664	0.599	0.996	0.437	0.536

Notes: Author Calculation. Standard errors in parentheses. Significance levels * p<0.10, ** p<0.05, *** p<0.010.; The dependent variable is tax revenue (% GDP); The table is based on a two-step System GMM regressions. GMM estimator uses first differencing and the lagged values of the endogenous variables as instruments.

3.2 Marginal effects of VAT adoption

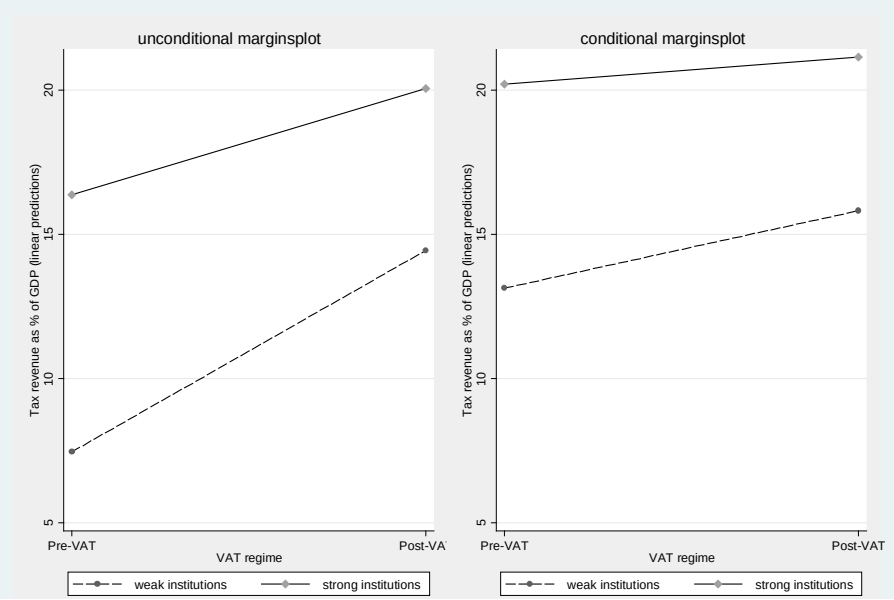
As we can see from the interaction terms between the VAT dummy and institutional quality in column 1 of Table 2, VAT adoption yields a significant boost to tax revenue. This is true for countries with weak and strong institutions alike. The marginal contribution of VAT adoption to the increase in tax revenue appears to be higher for countries with weak institutions. Similarly, in column 2, VAT adoption yields a positive impact on tax revenue for both developing and developed countries, the former benefiting more in relative terms. Although the level of tax

[8] The category of developed countries includes high-income countries (OECD and non-OECD).

revenue before or after VAT is higher in richer countries, poorer countries happen to gain more (relative to initial tax revenue) following the adoption of VAT.

Figure 3 plots the marginal effects for column 1 of Table 2.[9] It shows that (i) countries with better institutions derive a higher tax revenue than countries with weaker institutions – i.e., solid lines are above the broken lines and (ii) Adoption of VAT has yielded significant gains in tax revenue – i.e., lines are positively sloped. Quantitatively, the conditional marginal effects indicate that VAT adoption increases tax revenue from an average 20 to about 21% of GDP in countries with strong institutions. The counterparts with weak institutional quality, tax revenue improves from an average value of about 13 to 15.3% of GDP.

Figure 3: Marginal effects of VAT adoption on tax revenue (weak vs. strong institutions)



Note: Author Calculation; Weak institutions = average PRS score <0.5; strong institutions = average PRS score >=0.5. Left-panels show the unconditional margins plot (i.e., tax revenue across VAT regimes, estimated without controlling for other determinants of tax effort), while right-panels show conditional margins plot (i.e., level of tax is estimated across VAT regimes, controlling for main determinants of tax effort).

3.3 The case of SSA

Previous studies have not been able to identify a clear positive impact of VAT on tax collection in SSA (e.g., Ahlerup et al., 2015; Keen and Lockwood, 2010).[10] For instance, Keen and Lockwood (2010), whose study largely follows similar specification as this study, analysed data

9 Marginal effect here implies the partial derivatives of the regression equation (tax revenue) with respect to a variable of interest (VAT adoption and other controls) for each unit in the data. The marginal effect, as such, represents the slope of the prediction function, measured at a specific value of the regressors.

10 Ahlerup et al. (2015) argued that VAT adoption did not significantly increase tax revenues in SSA, based on their study on narrow sample of only SSA countries over 1980-2010. They attributed this primarily to the weak institutional capacity of SSA countries, which limited the effectiveness of VAT as a revenue-raising tool. Despite differences in empirical methodology and specification between this study and Ahlerup et al. (2015), results in Column 5 partially align with this, as both post-VAT coefficients (i.e., for weak and strong institution SSA countries) are positive but not statistically significant in our analysis using only sample of SSA countries. However, as can be seen in columns 3 and 4, we are able to see significant effects of VAT adoption in SSA countries in our analysis on a larger sample of developing countries, i.e. also controlling for VAT's performance in other developing countries.

from a broad sample of 142 countries over the 1975–2000 period and reported a positive effect of VAT on tax collection in a wide range of countries and regions, but not in SSA. In particular, they predicted an average negative impact of VAT in SSA countries (14 countries with negative effects and 11 countries with positive effects). One explanation behind their startling result for SSA may relate to the time span of their data set – as it may take time for tax administrations to properly implement VAT reforms. To get a better insight, we provide a sub-period analysis around the year 2000.[11]

Figures 4 (Panel-(a) and Panel-(b)) plot marginal effects for results in columns 6 and 7 of Table 2, respectively. When we look at the experience of SSA countries for the period up to 2000 (Figure 4, Panel-(a) and column 6 of Table 2) – i.e., the period covered by earlier studies like Keen and Lockwood (2010) – we indeed fail to see the typical gain in tax revenue following VAT adoption. Rather, VAT adoption coincided with a drop in tax revenue in SSA in the pre-2000 period. The results reported in column 4 show also that VAT adoption coincided with a reduction of tax revenue in SSA in 1980-2010.

For non-SSA developing countries, we cannot reject the hypothesis that VAT does not affect tax revenue in pre-2000. However, we see revenue gains in SSA when we separately analyze the post-2000 period (Figure 4, Panel-(b) and column 7 of Table 2).[12] Quantitatively, conditional marginal effects show that tax revenue increases from an average of about 14% to a bit over 15% of GDP ratio. An explanation for this result might be the fact that in the initial years of VAT adoption (see Table 3), especially in the 1990s, some SSA countries might have had a net loss of tax revenue, as the tax proceeds from VAT might not have been big enough to offset tariffs and other trade taxes lost when they were replaced by VAT (Jensen and Tarp, 2005).

Figure 4: Marginal effects of VAT adoption (SSA vs other developing countries)

Panel-(a): 1970–2000 **Panel-(b): 2001–2013**

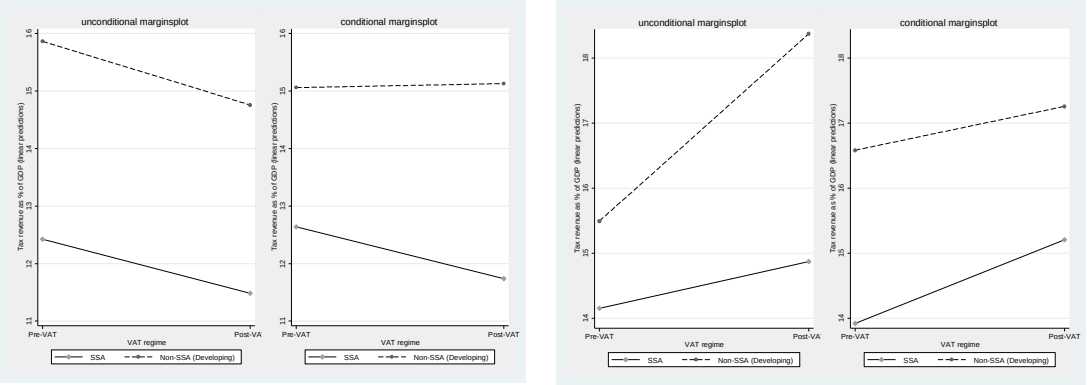


Table 3: VAT adoption in African countries (pre- and post-2000)

VAT adoption (pre-2000)				VAT adoption (post-2000)			
Country	**VAT intro.**	**Country**	**VAT intro.**	**Country**	**VAT intro.**	**Country**	**VAT intro.**
Côte d'Ivoire	1960	Madagascar	1994	Botswana	2002	Lesotho	2003
Morocco	1986	Togo	1995	Burundi	2009	Malawi	2002
Tunisia	1988	Mauritania	1995	Cape Verde	2004	Mozambique	2008
Kenya	1990	Zambia	1995	Central Afr. Rep.	2001	Namibia	2000

11 We have conducted robustness exercise with alternative cut-off years (e.g., pre and post 1998, 1999, 2001, 2002), and the results largely stand.

12 We also get results showing revenue gains from VAT on the full sample (i.e., mixing pre-post 2000), tough with weaker significance (column 3 of Table 2).

Mali	1991	Gabon	1995	Chad	2000	Rep. of Congo	2012
Benin	1991	Uganda	1996	Congo, Dem. Rep.	2012	Rwanda	2001
Egypt	1991	Guinea	1996	Djibouti	2009	Senegal	2001
South Africa	1991	Tanzania	1998	Equatorial Guinea	2004	Seychelles	2012
Algeria	1992	Ghana	1998	Eritrea	2010	Sierra Leone	2009
Burkina Faso	1993	Mauritius	1998	Ethiopia	2003	Sudan	2000
Nigeria	1993	Cameroon	1999	Gambia	2013	Swaziland	2013
Niger	1994			Guinea-Bissau	2001	Zimbabwe	2004

Sources: Alavuotunki and Pirttila (2015), Ernst and Young (2015) and Royal Malaysian Customs Department (http://gst.customs.gov.my/en/gst/Pages/gst_ci.aspx)

3.4 Robustness analysis

In this section, we have conducted a series of robustness exercises – where the most important econometric issues have been addressed. From our robustness exercises, the main findings remain qualitatively unchanged. Importantly, (i) VAT has contributed to the rise in tax revenues of countries; (ii) the more efficient the VAT system, the higher the tax revenue; (iii) the tax revenue of neighboring countries is itself a strong indicator of the potential tax revenue that a country is likely to collect;[13] and (iv) countries with strong institutions display positive and highly significant effect of VAT adoption. In countries with lower institutional scores, VAT adoption was positive but failed to be robustly significant.

First, we try to account for the dynamic effects of tax using the log values of our dependent variable (columns 1 and 2, Table A1). This has been done to overcome issues of dynamic stability seen in estimations that introduce the dynamic coefficient while using the tax ratio (which is in percentages) as a dependent variable. Coefficients of lagged tax ratios are positive and significant.

Second, we use the Hodrick-Prescott procedure to filter our data and control for time trends (column 3, Table A1). We take consecutive five-year period averages to control for business cycles and other time-related issues of macroeconomic cyclicality (column 4, Table A1).

Third, we make extra checks for endogeneity using residuals from the VAT adoption equation (column 5, Table A1). In the first stage, VAT adoption regressions initially run a VAT dummy on the explanatory variables used to estimate the tax revenue function.[14] In the second stage, we subsequently plug residuals of the adoption function into the revenue function to control for endogeneity. This is useful since the decision to adopt VAT could itself be endogenous to the tax ratio for various reasons. For instance, it could be argued that VAT take-up is stronger in countries

[13] Neighbouring countries share close economic and institutional characteristics. Thus, the level of tax revenue in a country is often a good predictor of the level of tax revenue in neighbouring countries. Further, a significant part of VAT revenue tends to be collected at national borders. Keen (2008), for instance, shows that many developing countries collect more than half the gross value of VAT at their borders.

[14] While running regressions that estimate the major determinants for VAT adoption, we make control for time effects by incorporating time dummies among the explanatory variables. We also make spatial control for the seven geographic regions that our dataset spans. Namely, East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East & North Africa, North America, South Asia, Sub-Saharan Africa. Further, we make controls for neighbourhood effects of VAT adoption using (inverse of) mean VAT adoption year within geographic regions. Countries are likely to adopt VAT if other countries in their respective region adopt VAT earlier (i.e. in regions where the mean year of adoption is lower). This follows the literature's emphasis on neighbourhood effects in the adoption process (Keen and Lockwood, 2010). Generally, the evidence suggests that countries with higher income, population size and institutional quality are more likely to adopt VAT. Further, countries who are located in a regions where there are more early adopters of VAT also tend to follow suite and adopt VAT.

that already have relatively higher tax revenue ratios. As a case in point, developed countries were pioneers in VAT adoption before developing countries started to adopt it en masse from the early 1990s onwards. Further, there could be other confounder factors (e.g., the presence of conducive economic, policy, or institutional settings) that decide VAT adoption and, for the same reason, imply higher levels of tax revenue.

Fourth, we utilize an alternative dependent variable, namely taxes on goods and services (as a ratio of revenues), instead of the tax to GDP ratio (columns 6 and 7, Table A1). This is done to make sure that the results are not simply specific to our variable selection. Since VAT is a tax on the production process (value addition), arguably, the dynamics of this variable should be significantly explained by the adoption of VAT.

Fifth, we address data limitations for some countries by compiling tax data from multiple sources and running our estimation on this expanded data (columns 8 and 9, Table A1; see also section 2.2).[15]

Sixth, in a separate analysis, we tried to identify possible disparities across different institutional country clusters. Specifically, we try to see whether countries with strong and weak institutions significantly differ in their revenue dynamics and how the adoption of VAT has impacted them (Table A2 and A3). [16] In both Tables A2 and A3, the odd columns (1, 3, …, 13) represent countries with weak institutions, while the even columns (2, 4, …, 14) represent countries with strong institutions. Further, in Table A2 the institutional clusters (i.e. upper and lower groups) are formed by using a threshold benchmark score (=0.5) for the indices. For the sake of robustness, the clusters in Table A3 are formed using the mean scores for the indices. The latter exercise helps us to account for the fact that countries receive a higher score on average on some of the indices and score rather badly on others (e.g. 'control of corruption', as seen in section 2). From the results, we have a consistently positive coefficient for our VAT dummy that is also highly significant in the cluster of countries with strong institutions (see the even columns in Tables A2 and A3). This is true for the country clusters formed using the aggregate institutional index (columns 1 and 2 in Tables A2 and A3), and also the six specific institutional indices that make up the aggregate index (columns 3–14 of Tables A2 and A3).

4. Conclusion

The objective of this paper was to examine the extent to which VAT adoption is a relevant option for developing countries that aim to close their huge financing gap. Further, we examined whether having better institutional quality translates to even more revenue for VAT-adopting countries. We estimate the relationship between tax revenue (as a share of GDP) and VAT adoption, indices of institutional quality (e.g., accountability, political stability, government effectiveness, regulatory quality, the rule of law, corruption), and various other standard determinants of tax revenue (country wealth, openness, size of informal sector, population size, share of dependent population etc.). Moreover, we include a spatial lag term to control for regional determinants of tax effort.

Analysis of data from 149 countries over the 1970–2013 period indicates that VAT adoption improved tax revenue collection in both developed and developing (SSA and non-SSA) countries.

[15] Although this expanded database (for use in this particular robustness exercise) is comprehensive in its coverage of countries (and goes beyond the breadth of our main WoRLD data), the fact that it is collected from multiple sources may create some discrepancies.

[16] These additional tables are available in an online appendix and in the working paper version of this paper.

Moreover, the marginal effect of VAT adoption is estimated to be strong for SSA and other developing countries compared with their developed counterparts. The positive effect of VAT on tax collection in SSA is reassuring, because some earlier studies were not able to identify an overall positive effect for the region. We show that analysis of data well beyond the initial years of VAT adoption is important for finding a positive effect for SSA. In particular, a sub-period analysis shows that VAT adoption is associated with a decrease in tax collected in SSA prior to the year 2000, whereas for the period post-2000 we have been able to identify a positive relationship between VAT adoption and tax revenue collection in the region. We argue that the negative impact observed in the first sub-period might be due, for instance, to short-term reductions in tax revenue if the immediate revenues from VAT at its adoption do not fully compensate for the proceeds of established tax instruments that the VAT was intended to replace (e.g. trade taxes that were common in the past in the region). However, if in the medium and long term the tax authorities' capacities develop (e.g. electronic scanners, cash register machines, efficient revenue collection bureaucracy, etc.), then the revenue collection from VAT starts to improve significantly in many countries.

As regards the role of institutional quality, we find that tax revenue collection is higher in countries with better institutional quality – even before VAT adoption. We find that VAT adoption leads to an increase in tax revenue in both countries with strong and weak institutions. Interestingly, the marginal effect of adopting VAT is estimated to be higher in countries with weak institution, possibly because the latter start from a relatively lower tax revenue base. This result could also capture the fact that VAT adoption could be combined with other institutional reforms that improve tax collection in weak institution countries. Given that VAT has now been adopted in almost all countries across the world, our findings suggest the need to promote reforms to improve the quality of institutions that facilitate tax collection in developing countries. This is an area where development cooperation could play a catalytic role in supporting such reforms.

Bibliography

Ahlerup, P., Baskaran, T. and Bigsten, A. (2015) Tax innovations and public revenues in sub-Saharan Africa. *Journal of Development Studies*, 51(6):689–706.

Akitoby, B., Baum, A., Hackney, C., Harrison, O., Primus, K., & Salins, V. (2020). Tax revenue mobilization episodes in developing countries. Policy Design and Practice, 3(1), 1-29.

Alavuotunki, K., Haapanen, M., & Pirttilä, J. (2019) The Effects of the Value-Added Tax on Revenue and Inequality, The Journal of Development Studies, 55:4, 490-508.

Aidt, T., Dutta, J. and Sena, V. (2008) Governance regimes, corruption and growth: theory and evidence. *Journal of Comparative Economics*, 36(2):195–220.

Aizenman, J. and Jinjarak, Y. (2005) The collection efficiency of the value added tax: theory and international evidence. Working Paper 11539. NBER.

Aizenman, J. and Jinjarak, Y. (2006) Globalization and developing countries: a shrinking tax base? Working Paper 11933. NBER.

Alavuotunki, K. and Pirttila, J. (2015) The consequences of the value added tax on inequality. Working Paper 2015/111. UNU-WIDER.

Anselin, L. (1988). *Spatial Econometrics: Methods and Models*. Boston: Kluwer

Araujo, L. and Arvate, P. (2016) Institutional quality and capital taxation. *International Tax and Public Finance*, 23:25–47.

Auriol, E. and Warlters, M. (2012) The marginal cost of public funds and tax reform in Africa. *Journal of Development Economics*, 97:58–72.

Bai, C., Ma, H. and Pan, W. (2012) Spatial spillover and regional economic growth in China. *China Economic Review*, 23:982–990.

Benitez, J. C., Mansour, M., Pecho, M., & Vellutini, C. (2023). Building Tax Capacity in Developing Countries. International Monetary Fund.

Bird, R. and Gendron, P. (2007) *The VAT in Developing and Transitional Countries*. Cambridge: Cambridge University Press.

Bird, R., Martinez-Vazquez, J. and Torgler, B. (2008) Tax effort in developing countries and high income countries:the impact of corruption, voice and accountability. *Economic Analysis and Policy*, 38(1):55–71.

Blanco, L. (2012) The spatial interdependence of FDI in Latin America. *World Development*, 40(7):1337–1351.

Blundell, R. and Bond, S. (1998) Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87:115–143.

Boadway, R. and Sato, M. (2009) Optimal tax design and enforcement with an informal sector. *American Economic Journal: Economic Policy*, 1(1):1–27.

Bodea, C. and A. Lebas (2014). The Origins of Volontary Compliance: Attitudes Toward Taxation in Urban Nigeria. *British Journal of Political Science*, pp.1-24.

Cliff, A.D. and Ord, J.K. (1981) *Spatial Processes: Models and Applications*. London: Pion.

Cnossen, S. (2015) Mobilizing VAT revenues in African countries. *International Tax and Public Finance*, 22(6):1077–1108.

Dioda, L. (2012) *Structural Determinants of Tax Revenue in Latin America and the Caribbean: 1990–2009*. Santiago: CEPAL.

Drukker, D., Peng, H., Prucha, I. and Raciborski, R. (2013) Creating and managing spatial-weighting matrices with the spmat command. *Stata Journal*, 13(2):242–286.

Drury, A., Krieckhaus, J. and Lusztig, M. (2006) Corruption, democracy, and economic growth. *International Political Science Review*, 27(2):121–136.

Ernst and Young (2015) *Worldwide VAT, GST and Sales Tax Guide 2015*. London: EYGM Ltd.

Getis, A. (2007) Reflections on spatial autocorrelation. *Regional Science and Urban Economics*, 37:491–496.

Godin, M., Houssa, R. and Megersa, K. (2017) The performance of VAT in DGD partner countries. Working Paper 16. University of Namur, BeFinD.

Gupta, A. (2007) Determinants of tax revenue in developing countries. Working Paper 07/184. Washington, DC: IMF.

Jensen, H.T., & Tarp, F. (2005). Trade liberalization and spatial inequality: A methodological innovation in a Vietnamese perspective. *Review of Development Economics*, *9*(1), 69-86.

Kathavate, J. and Mallik, G. (2012) The impact of the interaction between institutional quality and aid volatility on growth: theory and evidence. *Economic Modelling*, 29:716–724.

Keen, M. (2008) VAT, tariffs, and withholding: border taxes and informality in developing countries. *Journal of Public Economics*, 92:1892–1906.

Keen, M. (2013) The anatomy of the VAT. Working Paper 13/1111. Washington. IMF.

Keen, M. and Lockwood, B. (2006) Is the VAT a money machine? *National Tax Journal*, 59(4): 905–928.

Keen, M. and Lockwood, B. (2010) The value added tax: its causes and consequences. *Journal of Development Economics*, 92:138–151.

Keen, M. and Mansour, M. (2010) Revenue mobilization in sub-Saharan Africa: challenges from globalization I – trade reform. *Development Policy Review*, 28(5):553–571.

Kneller, R., Bleaney, M. and Gemmel, N. (1999) Public policy and the government budget constraint. *Journal of Public Economics*, 74:171–190.

Kondo, K. (2015) Spatial persistence of Japanese unemployment rates. *Japan and the World Economy*, 36: 113–122.

Le, T.M. (2003) Value added taxation: mechanism, design and policy issues. Practical issues of tax policy in developing countries (course). Washington. World Bank.

LeSage, J.P. and Pace, R.K. (2009). *Introduction to Spatial Econometrics*. Boca Raton: CRC Press.

Li, C. and Whalley, J. (2012) Rebalancing and the Chinese VAT: some numerical simulation results. *China Economic Review*, 23:316–324

Lin, Shuanglin. 2008. China's Value-Added Tax Reform, Capital Accumulation, and Welfare Implications. *China Economic Review* 19(2):197–214

Mauro, P. (1995) Corruption and growth. *Quarterly Journal of Economics*, 110(3): 681–712.

Moore, M. (2014) Revenue reform and state building in anglophone Africa. *World Development*, 60: 99–112.

Ordonez, J. (2014) Tax collection, the informal sector, and productivity. *Review of Economic Dynamics*, 17: 262–286.

Persson, T. and Tabellini, G. (2003) *The Economic Effects of Constitutions*. Cambridge, MA: MIT Press.

Pomeranz, D. (2015) No taxation without information: deterrence and self-enforcement in the value added tax. *American Economic Review*, 105(8): 2539–2569.

Prichard, W., Cobham, A. and Goodall, A. (2014) The ICTD government revenue dataset. ICTD Working Paper 19. London: Institute of Development Studies.

RMCD (2016) Countries implementing GST or VAT. Putrajaya: RMCD. http://gst.customs.gov.my/en/gst/Pages/gst_ci.aspx (accessed 10/06/2016).

Rodrik, D. (1998) Why do more open economies have bigger governments? *Journal of Political Economy*, 106: 997–1032.

Roodman, D. (2009) "How to do xtabond2: An introduction to difference and system GMM in Stata." Stata Journal 9(1):86–136.

UNECA (2016) Domestic resource mobilization in Africa: a focus on government revenue. Addis Ababa: UNECA, Inter-Agency Task Force on Financing for Development.

Younger, S. D., Osei-Assibey, E., & Oppong, F. (2017). Fiscal incidence in Ghana. *Review of Development Economics*, *21*(4),e47-e66.